

Annual Report: FY 2016 Cooperative Recovery Initiative/NRPC RFP

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Project Name: Addressing structural uncertainty in a decision-making framework to inform scaup conservation planning

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Project Location: Red Rock Lakes National Wildlife Refuge, Lima, MT

Project Goal: The primary goal of this project is to estimate process correlation between natural mortality and harvest mortality for a population of lesser scaup being monitored at Red Rock Lakes National Wildlife Refuge in southwestern MT. An estimate of process correlation between these two vital rates will be used to assess the additive or compensatory nature of harvest mortality for adult females in this study population for the years 2005 - 2015. This relationship has been identified as a key structural uncertainty in the current population model used for lesser scaup harvest at the continental scale.

Expected Conservation Outcome of the Project: This project is expected to offer insight into how natural mortality rates of lesser scaup (and its complement, survival rates) change in response to harvest rates. Our results will help guide the U.S. FWS in its management of lesser scaup harvest which has the objective of maximizing long-term harvest (i.e., sustainability) within the population constraint set by the North American Waterfowl Management Plan.

Project Measureable Objectives: 1) Estimates of annual natural and harvest mortality rates for adult female lesser scaup over our entire study period (2005 - present). 2) An estimate of process correlation for the study period based on the natural and harvest mortality rates for the study population (objective 1).

How are objectives measured: The objectives of this project are deemed complete by obtaining the estimates described above and by publishing the results in a peer-reviewed, academic journal. The analysis required to obtain these estimates consists of two-tiers, the first of which is using maximum-likelihood, multistrata models and AICc model-selection techniques to choose a model structure most appropriate for describing our lesser scaup data. The second analysis requires estimating process correlation from our data in a Bayesian version of the model identified as most parsimonious with AICc model-selection.

Assessment of Long-term Performance this year:

- ☐ 80 –89% conservation objective achieved

Project Status: This project is getting closer to completion as the AICc model selection phase of the analysis is complete and we are currently working on estimating of process correlation. We have identified several shortcomings in the existing methods (i.e.; published analyses available in the literature) for estimating process correlation and in interpreting process correlation estimates. We are currently addressing these shortcomings through simulation studies. Estimating process correlation between vital rates using Bayesian mark-recapture models is a new approach to addressing the role of harvest in exploited populations. Because these methods are a promising technique for quantifying demographic responses to human exploitation, it is important to understand how multiple forms of bias affect the process correlation estimate. Our simulation results suggest that process correlation can be biased towards the hypothesis of additivity when crippling and non-reporting of individuals is not accounted for in these models. In contrast, the problem of competition bias may not be as problematic to account for as it currently accepted to be. The graduate student (Cody Deane) working on this analysis spent the 2016 summer working in Alaska on a separate project and will be defending the first model selection of this phase of this analysis in spring 2017. A process correlation estimate will be obtained using the model structure from his thesis.